

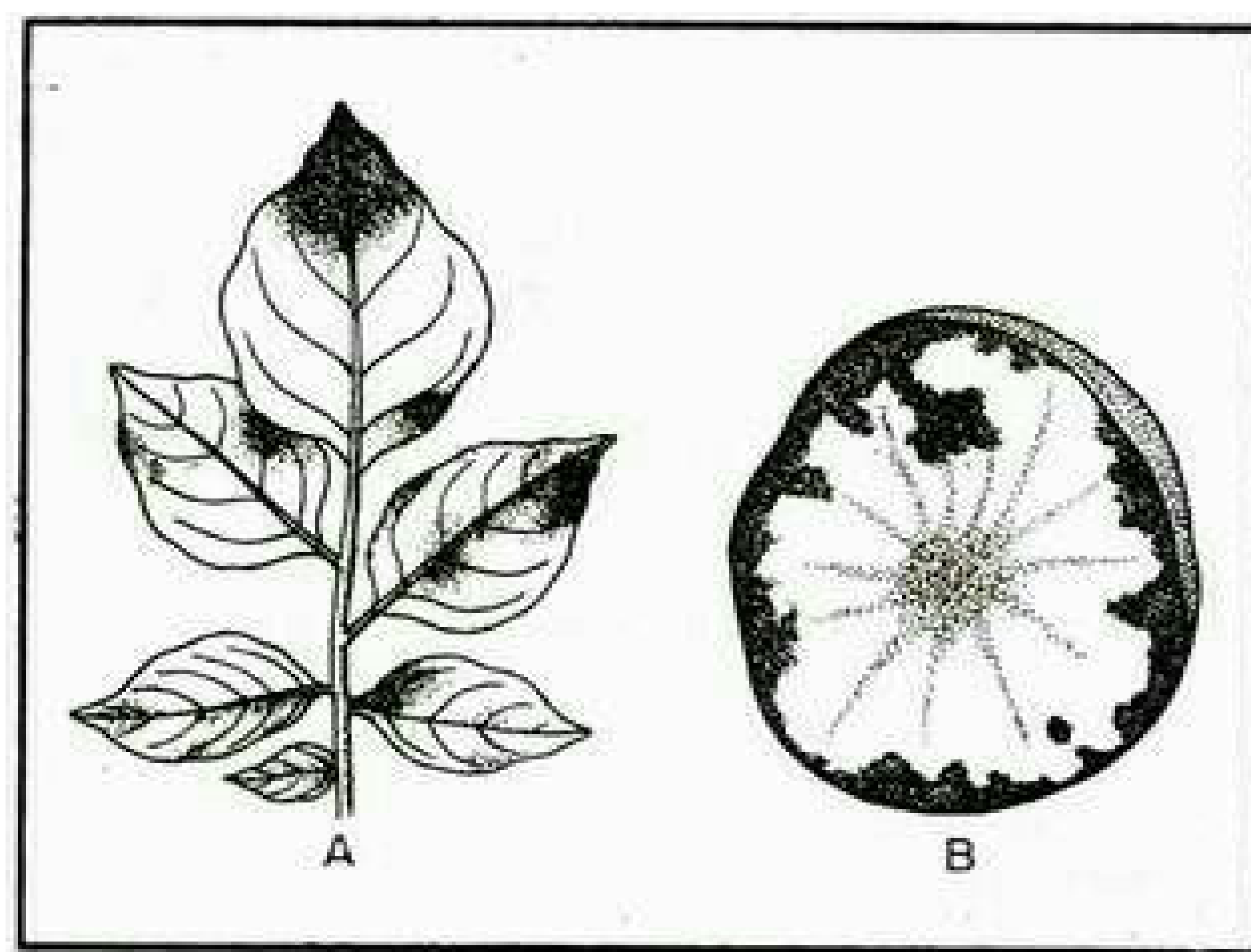
Disease of Potato

Late Blight of Potato

Causal organism: *Phytophthora infestans*.

Late blight is the major limiting factor to increase potato production. In Bangladesh, the infection of late blight was first reported in 1922.

Symptoms



Leaves

- 1) Late Blight appears on potato or tomato leaves as pale green, water soaked spots often beginning at leaf tips or edges.
- 2) In moist weather, lesion enlarge rapidly and turn dark brown to purplish black. It forms brown blighted areas which are often surrounded by a pale yellowish green border.
- 3) A white downy growth of Sporangiospores and sporangia forms at the edges of the spot, most commonly on the lower leaf surface.

Stem

In severe cases on stem, the disease may extends on the stalk quickly and the entire crown may fall over in a rotten pulp in a day or two.

Tubers

If allowed to spray unchecked, the disease will reach the tubers. Affected tubers have a reddish brown decay below the skin. Early attacks of blight may not be visible on tubers but any infected tubers will rot in stored condition.

Disease Cycle

The Pathogen, over winter infected tubers. When that infected tubers are planted, the disease develop on the emerging plants. The fungus produces abundant spores and help in secondary spread of the disease. The spores are spread by rain water, wind and equipment. In presence of high humidity, the fungus forms sporangiospores/ Conidiophores through the stomata on the lower side of the leaves and produces zoospores (In cool weather, 12°C) or Conidia (In warm weather at about 25°C) on germination.

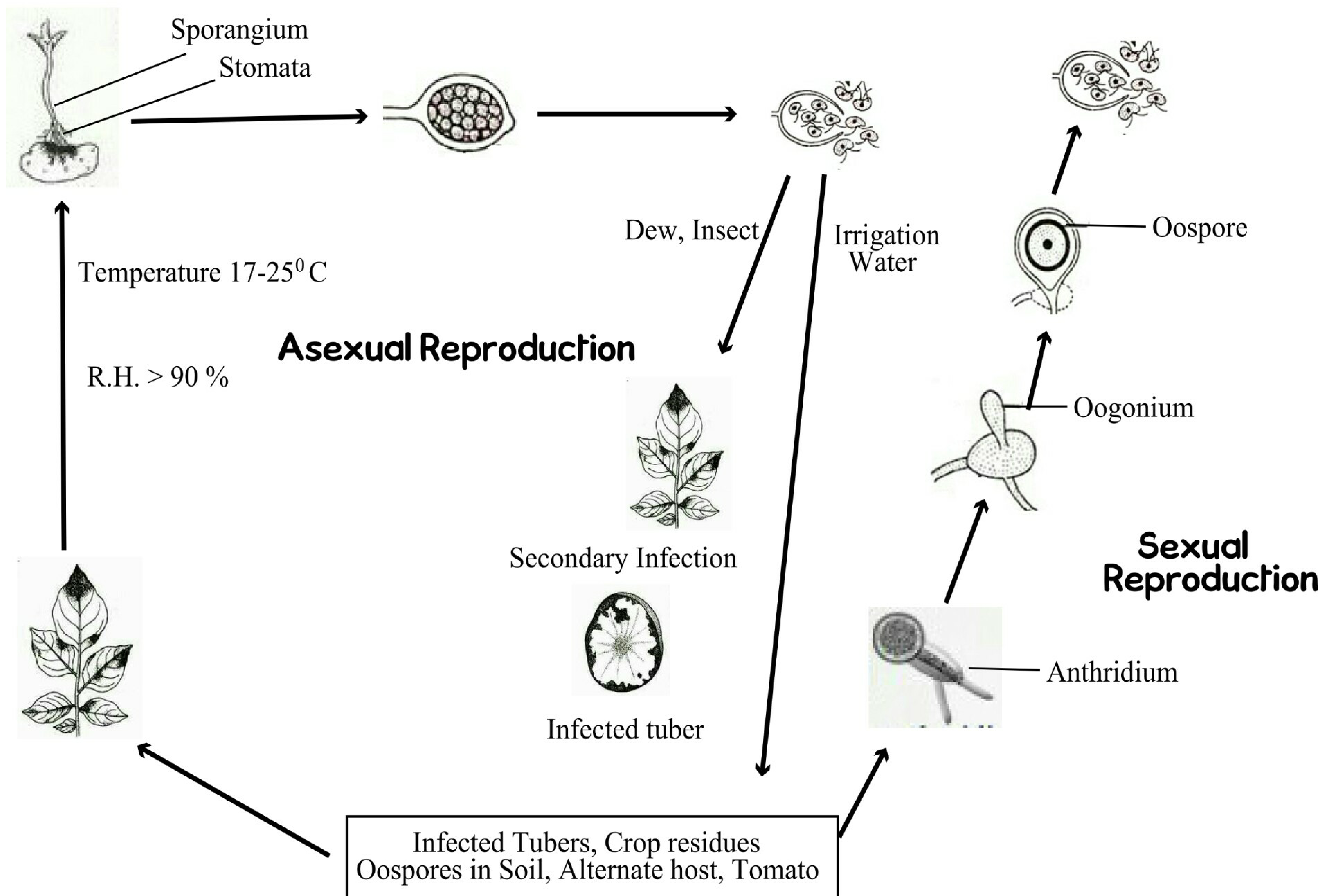


Fig: Disease Cycle of late blight of Potato (*Phytophthora infestans*)

Zoosporangia release many bi-flagellate zoospores and Conidia (asexually) and Oospores (Sexually) which may produce germ tube and infect the plant.

Favourable Condition

- Excessive humidity (90 % and above).
- Suitable temperature (10-12°C) for germination of Sporangia.

Forecasting of Disease

The following conditions are considered for forecasting the disease-

- ▲ Night temperature below 10°C for at least 4 hours.
- ▲ Minimum day temperature 10°C.
- ▲ Clouds on the next day.
- ▲ Rainfall during the next 24 hours of at least 0.1 mm.

Control Measure

1. Cultural Control

- ◆ Seed tubers should be taken from healthy plant.
- ◆ Crop residues and alternate host should be destroyed.
- ◆ Using disease resistant varieties. e.g. Cardinal, Diamant, Koofri sinduri etc.
- ◆ Crop rotation should be followed.
- ◆ Tubers should be collected after 7-10 days of cutting and removing top of the plant.
- ◆ Do not lift tubers when soil is wet.

2. Physical Control

- ◆ Seed (tuber) treatment with hot water, 40°C at 30 minutes.

3. Chemical Control

- ◆ Spraying with Ridomil (0.2 %) or Dithane M-45 or Copper oxichloride @ 3-4 g/L for 2-3 times at 10-15 days interval.
- ◆ Tuber should be treated by dipping in Bordeaux mixture (1%) or other fungicides e.g. Dithane M-45 (0.2 %) for 3-5 minutes. If weather remains wet and cool, spraying should be repeated every 10 days.
- ◆ Dip the tubers in formalin solution for 3-5 minutes and cover them under the moist gunny bags for 2 hours and finally dry them before sowing.

Early Blight of Potato/Tomato

Causal organism: *Alternaria solani*.

Symptoms

Seedling

Damping off at seedling stage of tomato, stem lesions occur and collar rot found.

Leaf

1. Initially small dark spots form on older foliage near the ground.
2. Leaf spots dark brown to black with concentric ring. Yellowish, dryer, drop or fall off.
3. Severely infected leaves turn brown and fall off or dead, dried leaves may cling to the stem.
4. Leaf spots are round, brown and can grow up to half inch in diameter.

Stem

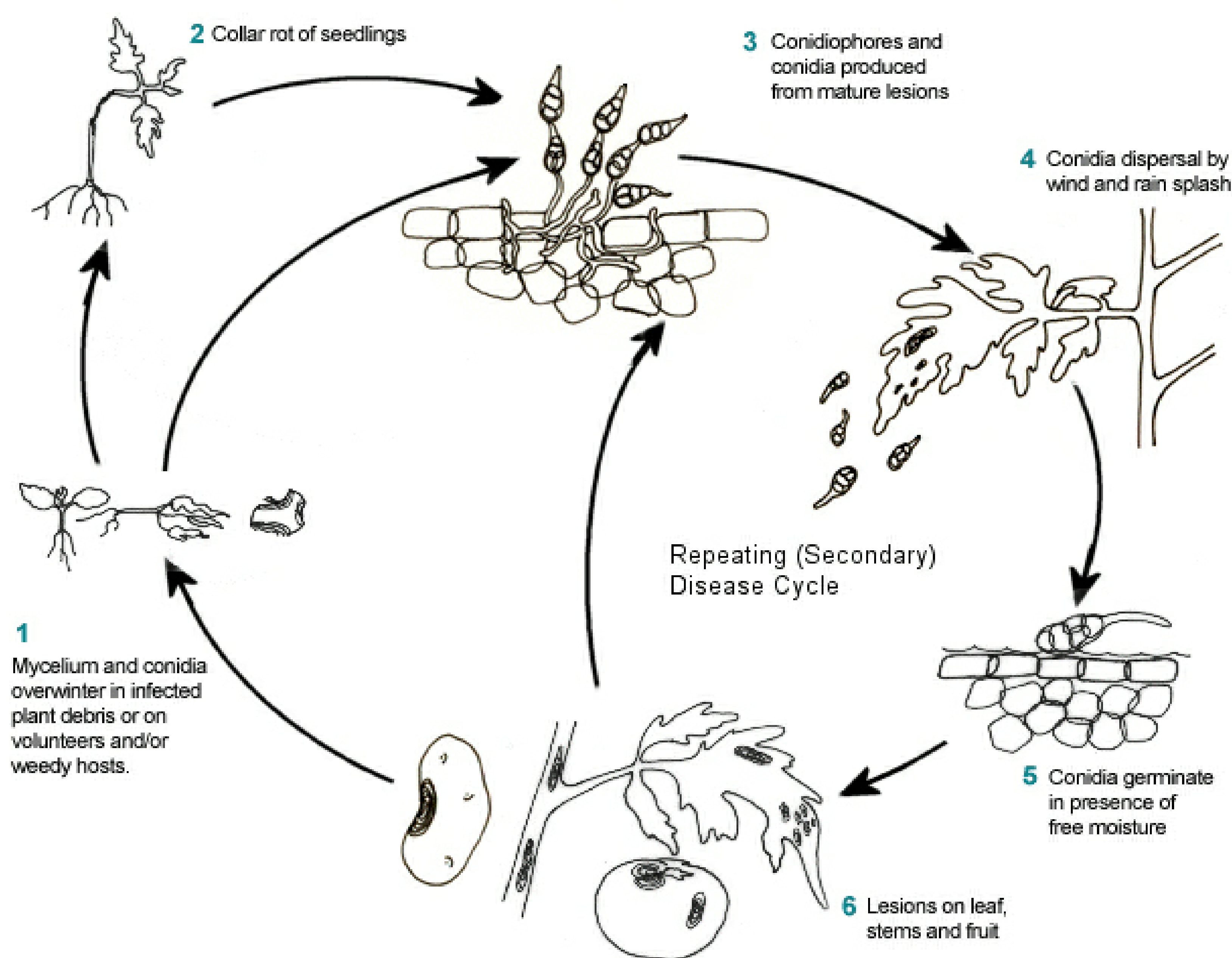
1. Sunken spots are found on the stem and branches.
2. Stem infections on older plants are oval to irregular, dry brown areas with dark brown concentric rings.

Fruits

1. Blossom end rot, small enlarge, sunken spots, leathery and velvety surface of fungus growth with conidia. Stem end rot, fissure symptoms are found on tomato. Over winter as mycelium and conidia in infected plant debris, seed borne in on seeds.
2. Infected fruit may drop from the plant.
3. Infected potato tubers develop dark, sunken lesions that are often surrounded by a purplish raised border. Under these lesions, the tissue is dry, leathery and brown.

Disease Cycle

Alternaria solani over winters primarily on infected crop debris. The dark pigmentation of the mycelium increases resistance to lysis which extends the survival time in the soil to several years. Thick-walled chlamydospores have been reported, but they are found infrequently. In mild climates, the pathogen can survive from season to season on volunteer tomato and potato plants as well as other weedy Solanaceous hosts such as horsenettle and nightshade.



Favourable Environment

- Disease develops at moderate to warm (59 to 80⁰ F) temperatures; 82 to 86⁰ F optimum.
- Rainy weather or heavy dew, 90% humidity or greater.

Control Measure

Cultural control

- ◆ Use resistant varieties.
- ◆ Seed treatment.
- ◆ Maintain adequate levels of both nitrogen and phosphorus.
- ◆ Crop rotation should be followed.
- ◆ Remove and destruction of weed host.
- ◆ Green housing with specific UV light absorbing field, since filtering out UV light inhibits conidia formation by fungi.



Biological control

- ◆ Biological control with bio-chemical agents. e.g. *Trichogramma* spp.
- ◆ Using bio-fungicides.

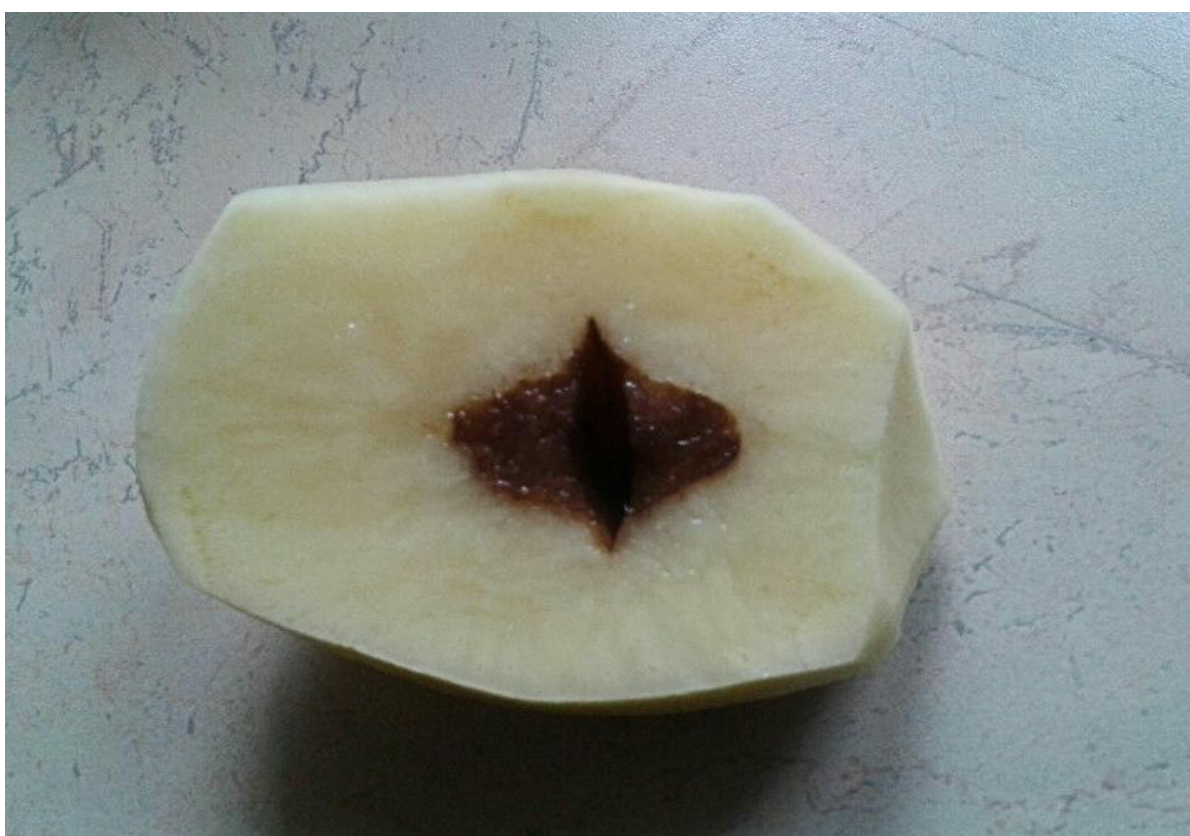

Chemical Control

- ◆ Using Copper oxichloride/ Dithane/ Mancozeb.

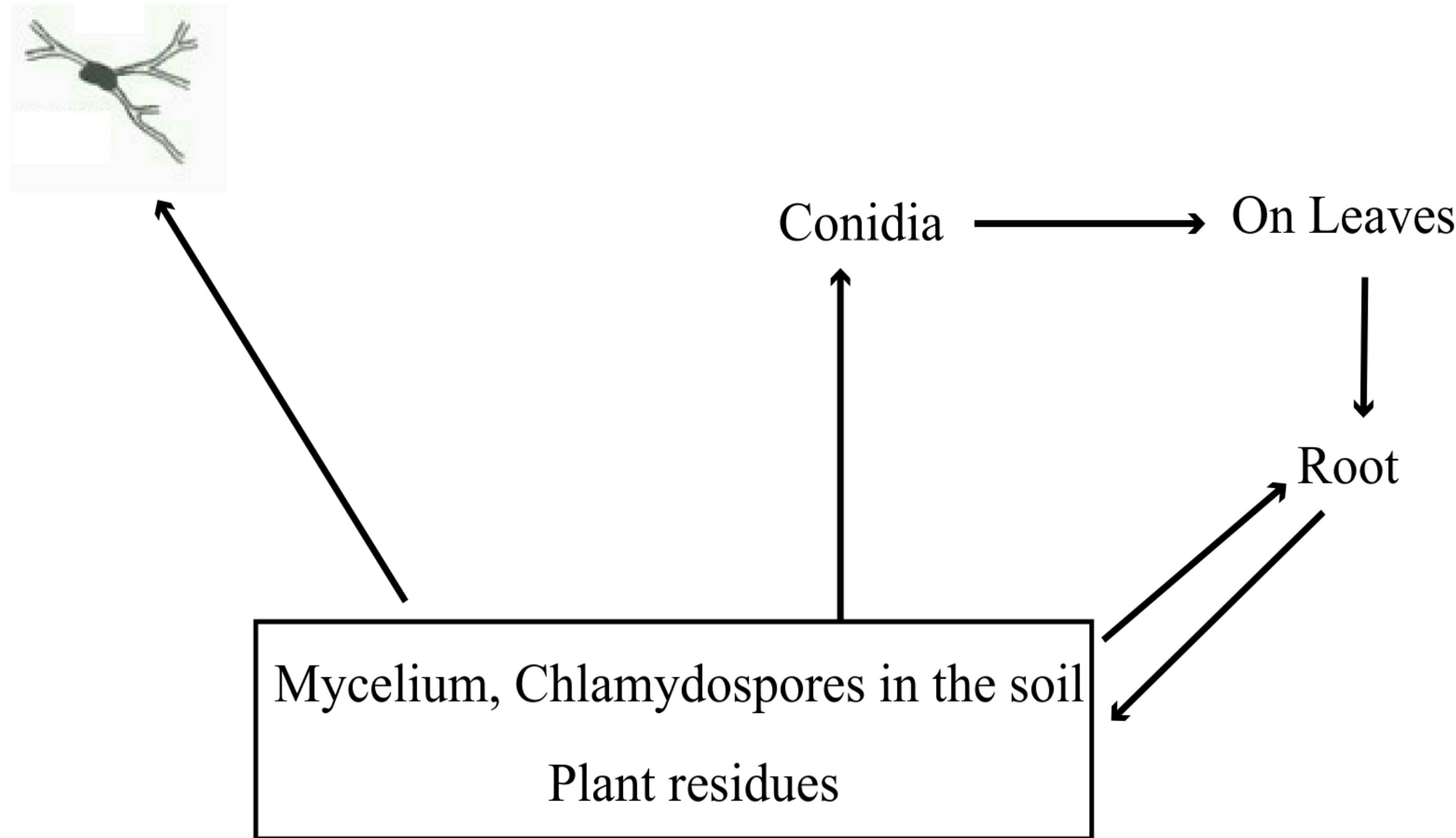
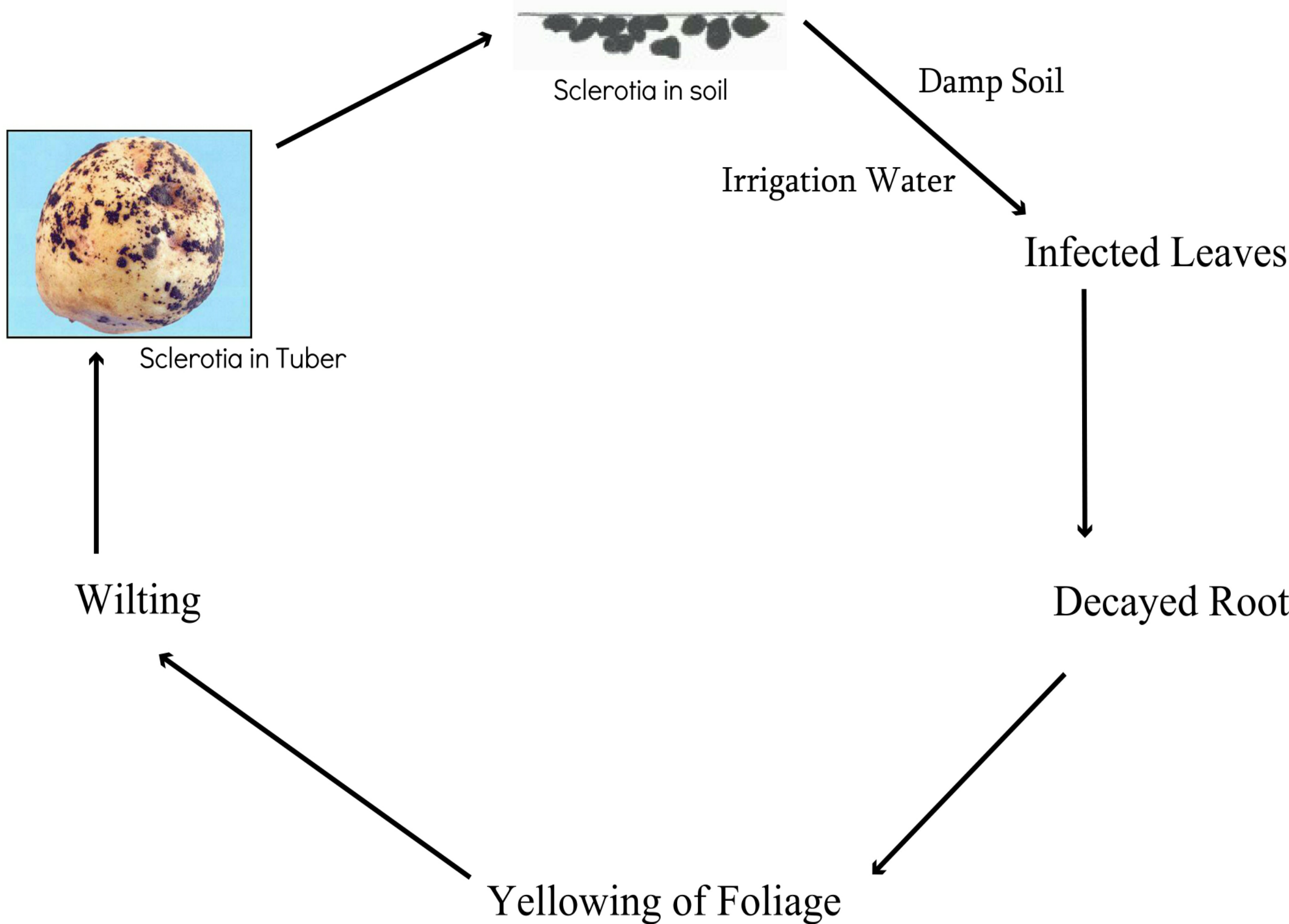
Distinguish Between Dry Rot and Soft Rot of potato

Dry Rot	Soft Rot
Causal organism: <i>Fusarium coeruleum</i> .	Causal organism: <i>Erwinia carotovora</i> .
1. It is an fungal disease.	1. It is a bacterial disease.
2. It occurs in storage condition.	2. It occurs in field as well as storage condition.
3. The skin over the affected area developed a series of concentric wrinkles.	3. A slimy rot is developed on the tuber.
4. White to Pink fungal mycelium appears on the wrinkled tubers.	4. No such mycelia are found in the rotted area.
5. The infected tubers; shrinks, dries and become hard by losing water.	5. The infected tubers become soft, decayed pulp masses.
6. On squeezing the affected tubers, no ooze as well as smell comes out.	6. On squeezing the affected tubers, bacterial ooze and Repulsive smell evolved.
	

Distinguish Between Hollow Heart and Black Heart disease

Hollow Heart	Black Heart
1. The tubers develop irregular hollow central cavity surrounded by greyish brown corky tissue having silvery appearance.	2. The tubers produces internal dark grey to purplish or ink black discolouration.
2. Excess nitrogen supplied during tuber formation and continuous wet spell after long dry period are responsible for this.	2. High temperature and low Oxygen supply during storage condition are responsible for this.
3. Mostly large, over growth tubers are affected.	3. Any tubers are affected.
4. It is a nutritional disease.	4. It is a physiological/physiogenic disease.
5. It is a field disease.	5. It is a storage disease.
	

Distinguish Between Verticillium wilt and Sclerotium wilt

Verticillium wilt	Sclerotium Wilt
Causal organism: <i>Verticillium albo-atrum</i> .	Causal organism: <i>Sclerotium rolfsii</i> .
1. Leaves yellowed, shriveled and drop down.	1. Yellowing of entire foliage.
2. Root and stem tissues are brown discoloured.	2. Root are rotten, small rounded Sclerotia are seen.
3. Tubers are partially or wholely decayed.	3. Tubers are decayed.
4. Disease Cycle: 	4. Disease Cycle: 

Comparison among Fusarium, Bacterial and Nemic wilt

Fusarium	Bacterial	Nemic
Causal organism: <i>Fusarium oxysporum</i> .	Causal Organism: <i>Pseudomonas solanacearum</i>	Causal organism: <i>Meloidogyne incognita</i> .
1. Yellowing of leaves. Burning of leaf margin followed by rapid wilting of plants/seedlings.	1. Yellowing of leaves, wilting and collapse of entire plant.	1. Leaves become yellowish green, deform and reduced in size.
2. Brown discolouration is found along the vascular system which are not visible from the outside.	2. Brown discolouration and vascular system found which often visible from the outside.	2. No such brown discolouration are formed.
3. Infected roots partially rotten.	3. Roots are partially rotten.	3. Root develops gall or knot.
4. When the infected stem or tubers are cut across and squeezed, no ooze and no bad odour come out.	4. Creamy white bacterial ooze comes out of the cut end and emits bad odour.	4. No such ooze comes out.
5. Soils and seed tuber are the source of infection.	5. Soils and seed tuber are the source of infection.	5. Soil is a source of infection.

6. Hot and dry weather favours of disease.	6. High temperature and high moisture favours for the disease.	6. High textured soil, temperature (25-28 ⁰ C) favour disease.
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Rhizopus Soft Rot of Sweet Potato

Causal Organism: *Rhizopus stolonifer* **Or** *Rhizopus nigricans*.

Symptoms

- ◆ Watery soaked rot with a characteristics odour of fermentation on burst of the skin.
- ◆ Later a ring rot appears of about 2 inches in diameter and 0.5 inches depth.
- ◆ In 4 to 5 days, the entire inner tissues of the root rot become soft, slimy and watery as they liquefy.
- ◆ If rotted area ruptured; the mycelium, sporangiospores and sporangia become visible.
- ◆ Root become murnmify.

Favourable condition

- ♣ Elevated temperatures of 25-29°C favor disease progression.
- ♣ Higher humidities.

Disease transmission

Considering this is primarily a post harvest disease, it is often transmitted due to unsanitary harvest equipment, wash lines, packing equipment and transportation containers.

Control

1. Avoid root injury.
2. Curing of sweet potato before storage.
3. Sterilization of store house with 2 % formalin.
4. Store sweet potatoes at 85% humidity and 13°C with proper ventilation.
5. Before storage, treated 1% Bordeaux mixture.
6. Rodents are control.
7. Cultivation of resistant varieties. e.g. Julian, Southern queen.
8. Transport roots in sanitary containers.

Little Leaf of Brinjal

Causal organism: Mycoplasma Like Organism (MLO).

Symptoms

1. Short, smaller leaves are produced.
2. Petioles are reduced; Leaves appear sticking to them.
3. Leaves become narrow, soft, smooth, thin and yellow in colour.
4. Distance between inter node is small.
5. Floral part transfer to green foliage.
6. Fruiting react mostly sterile.



Transmission

Not sap transmitted. MLO transmitted by Leaf hopper.

Alternate host

Tomato, potato etc.

Control Measure

- ◆ Destruction of infested plant and hosts.
- ◆ Growing on resistant varieties. e.g. Black beauty, Brinjal round etc.
- ◆ Chemical treatment with tetracyclins. e.g. Tetramycin @ 500 ppm.

Alternaria Blight of Cabbage/Cauliflower

Causal Organism: *Alternaria brassicae*.

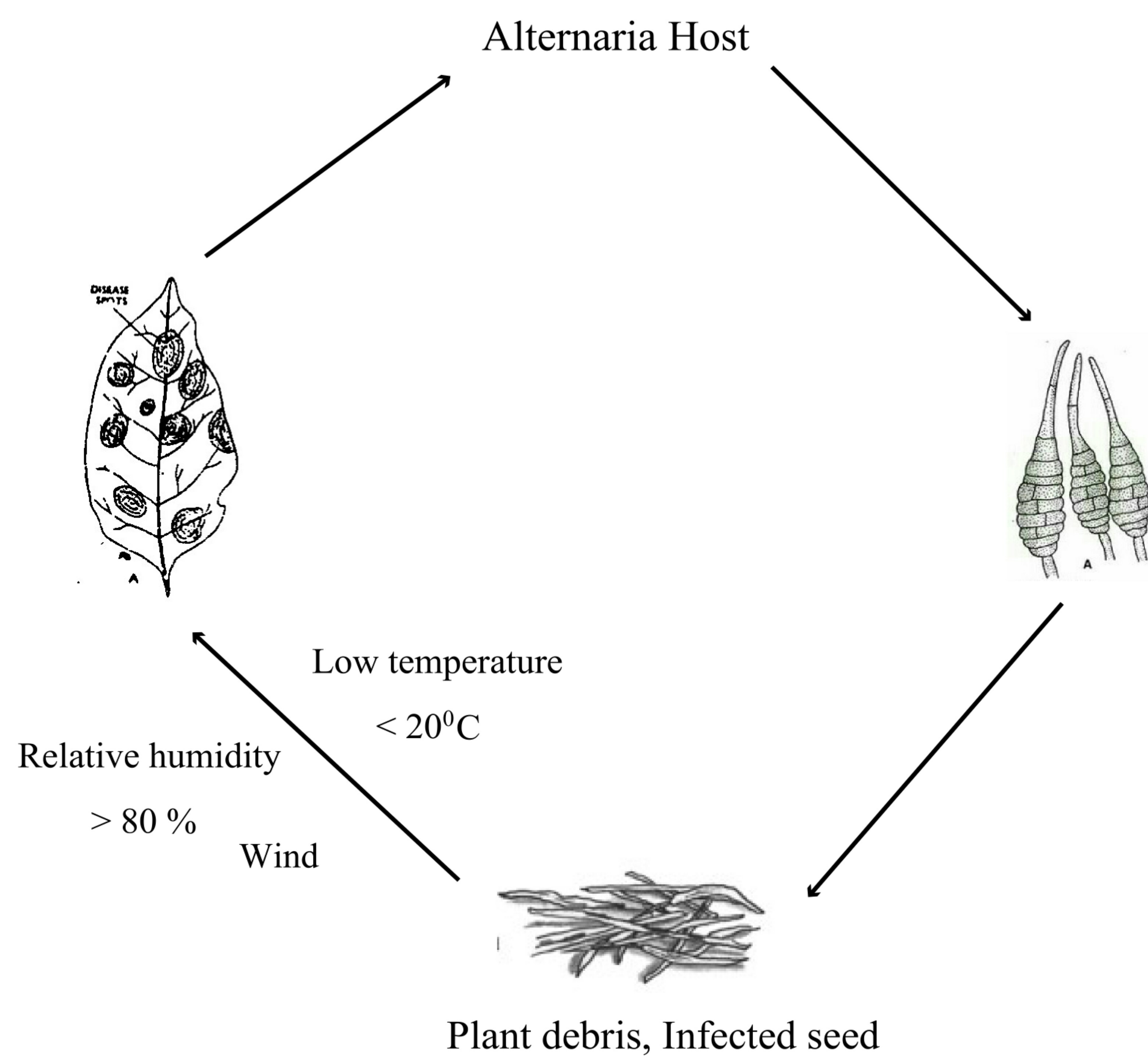
Alternaria brassicicola.

Symptoms

1. Yellowing of leaves and dwarf plant.
2. Dropping lower leaves one by one.
3. Root infection, Collar region rotten.
4. The edges of affected leaves become purplish and the base become brownish.



Disease Cycle



Control Measure

- ◆ Seed treatment with Provax 200 @ 3g/kg of seed.
- ◆ Foliar spraying with Rubral (2 ml/1 litre of water).
- ◆ Crop rotation should be followed.
- ◆ Spraying with Redomil (0.2%) or Dithane M-45 or Cupper oxichloride @ 3-4 g/L of water for 2-3 times at 10-15 days interval.
- ◆ Using disease resistant varieties.
- ◆ Crop residues and alternate host should be destroyed.
- ◆ Avoid overhead irrigation during head development.
- ◆ Control cruciferous weeds.
- ◆ Treat seed with hot water.

Anthracnose/Fruit Rot/Die-back of Chilli

Causal organism: *Colletotrichum capsici*.

Symptoms

The disease occur in two forms; Die-back and Ripe fruit rot.

Die-back

1. The disease causes necrosis of tender twigs from the tip to backward. The entire branch or the entire top of the plant may wither away.
2. Numerous black dots (acervuli of fungus) are found scattered all over the necrotic surface of the affected twigs.



3. Only the top or few side branches may be killed or in severe attacks the entire plant is withered. Partially affected plants bear fruit which are few and low quality.

Ripe fruit rot

1. Although red ripe fruits are frequently affected, anthracnose symptoms appear even on well developed green fruits.



2. Small black circular spots are appeared on the skin of the fruit and spread along the long axis of the fruit and thus becoming more or less elliptical.

3. The spots are usually sunken with black margin. Badly diseased fruit turn straw colour from normal color. Sunken spots are covered with pinkish mass of fungal spores.

4. The fruits with many spots drop off prematurely, resulting heavy loss in yield. Seeds are also infected by this fungus.

Favourable condition

- ▲ High temperature (28°C).
- ▲ High relative humidity (92% or above).
- ▲ Heavy and prolong dew deposition after rainy season.

Control Measure

A. Cultural control

- ◆ Seeds should be collected from spotless fruits.
- ◆ Disease crop debris should be collected and burnt.

B. Chemical control

- ◆ Seed treatment with Vitavax-200, Brassical @ 2g/ kg of seed.
- ◆ Spraying with Dithane-M 45 or Bavistin @ 0.2% solution, 3-4 times after 15 days interval when fruit begin to ripe.

Mosaic of Chilli

Causal organism: Tobacco mosaic virus.

Vector: Aphid (*Aphis gossypii*).

Symptoms

1. The most characteristics symptom appearance of dark green and light green areas on the leaf surface.
2. Leaves are greatly in size and filamentous like.
3. The diseased plant produces less flower and fruits. The fruits are usually deformed and rough in texture.

Transmission

The virus is sap transmissible. It is also transmitted by aphid.

Control Measure

- ◆ Field sanitation.
- ◆ Roughing and cultural practices.
- ◆ Use of optimum doses of nitrogenous fertilizer in the field.
- ◆ Destruction of lateral alternate host.
- ◆ Spraying with Malathion/Metasistox/Diazinon/Sumithion @ 0.1% solution at 10 days interval, starting from early stage of plant growth and stopped at least 20 days before plucking of fruits.

Leaf Curl disease of Chilli

Causal organism: Leaf curl virus.

Vector: White fly (*Bamici tabaci*).

Symptoms

1. The leaf curl is characterized by severe stunting of the plants with downward rolling and wrinkling of leaves.
2. Leaves become small in size; internodes are shortened, giving the plant as witches broom appearance.

3. Leaves are pale yellow coloured.
4. Fruiting is stopped or fruits that formed are small and deformed.

Alternate Hosts

Tobacco, Tomato, Papaya etc.

Transmission

The virus is not sap transmissible or not seed borne. It is transmitted by white fly.

Control Measure

- ◆ Field sanitation.
- ◆ Roughing and cultural practices.
- ◆ Use of optimum doses of nitrogenous fertilizer in the field.
- ◆ Destruction of lateral alternate host.
- ◆ Apply Carbofuran 3G @ 4-5 Kg/acre in the mainfield to control sucking complex and insect vectors selectively.
- ◆ If it is not possible spray the crop with systemic insecticides. Dimethoate 2 ml or Acephate 1g per litre of water.
- ◆ Collect and destroy infected virus plants as soon as they are noticed.

Lady's Finger Yellow mosaic disease

Causal organism: Yellow mosaic virus.

Vector: White fly (*Bemisia tabaci*), Persistent virus.

Symptoms

1. The vein is clearing and veinal chlorosis occur.
2. The leaves, vein and veinlets are conspicuous yellowing and they become thick.
3. In severe cases, the leaves become completely yellow.
4. Distortion of leaf stalks and stems occurs at the advanced stage of infection.
5. Fruits become dwarfed, malformed and are yellowing green.

Alternate host: Cotton.

Transmission

The virus is not sap transmissible. It is graft transmissible.

Control Measures

1. Cultivate resistant varieties.
2. Use seeds collected from disease-free plants.
3. Remove and destroy disease-affected plants from crop fields to avoid secondary spread.
4. Destroy host weeds, such as *Croton sparsiflora* and *Ageralium* spp.
5. Follow crop rotation.
6. Control the insect vector by spraying dimethoate 0.03 % or monocrotophos 0.05 %.

Disease of Cucurbits

Anthracnose of Cucurbits

Causal organism: *Colletotrichum lagenarium*.

Symptoms

Seedling stage

Cotyledons drop and wilt, lesions on stem near the ground.

Foliage

1. Spots as small yellowish or water soaked areas enlarge rapidly and turn brown almost cucurbits.
2. The dry dead tissues break and shatters; whole leaf dies.
3. Petioles become affected.

Stem

Elongated lesions with foliage destruction kill whole vine.

Fruits and Pedicel

1. Affected young fruit darken, shrivel and die (water melon).
2. Fruits are roughly circular, sunken, cankers and black.
3. When moisture present, centre of black lesion is lined with coloured gelatinous mass and spores.

Host crop

Cantaloupe, squash and pumpkin are less susceptible to anthracnose.

Favorable Condition

Warm, humid and rainy weather at frequent intervals is necessary for disease development.

Transmission

Wash water, cultivating equipments, cucumber beetle can carry the spores.

Control Measure

- ◆ Use resistant varieties.
- ◆ Field sanitation should be done.
- ◆ Crop rotation should be followed.
- ◆ Eradication of alternate host like Weeds, Wild Cucurbits etc.
- ◆ Using proper fungicide and insecticides.

Powdery mildew

Causal organism: *Erysiphe cichoracearum*.

Symptoms

Leaves

1. Foliar first sign as a whitish talcum like powdery growth under surface of the shaded crown leaves.
2. Areas of white powdery growth expand and coalesce and cover leaf surface.
3. Affected leaves wither and finally become dry and die.

Fruits

1. Premature ripening.
2. Poor flavour and texture.
3. Poor quality of fruits.
4. Pimping/patches of white mold on fruits.

Favourable condition

- ◆ Temperature 25°C or above.
- ◆ Relative humidity 70%.

Control Measure

1. Use resistant varieties.
2. Plant in areas with good air drainage and allow for maximum air circulation.
3. Crop rotation and fall plowing are of no benefit because the fungus does not survive in the field.
4. Sufficient spray of Thiovit (S containing)/Sodium bi carbonate @ 0.2 % solution.
5. Field sanitation.

Downy mildew

Causal organism: *Pseudoperonospora cubensis*.

Symptoms

1. First symptom appears as mosaic; Pale green areas separated by darker green, turn into yellow angular spots bounded by leaf veins.
2. In moist weather; Corresponding lower surface of leaf, covered with purplish fungus fruiting layer.
3. Colour changes almost white to black, entire leaf dries quickly.
4. May be dwarf with poor flavor (Muskmelon).
5. Fruit is covered with fungal growth.

Control Measure

- ◆ Wide spacing between plants.
- ◆ Good drainage system.
- ◆ Spray fungicide Dithane M-45/Redomil/Dithane Z-78 @ 0.2 % solution.